CLAIMS

1. An exhaust purification device for an internal combustion engine having, a NO_x storing catalyst arranged in an engine exhaust passage, the NO_x storing catalyst being comprised of a precious metal catalyst and a NO_x absorbent and, when an air-fuel ratio of inflowing exhaust gas is lean, cold storing nitrogen dioxide NO_2 contained in the exhaust gas in the NO_x absorbent when not activated and hot storing cold stored nitrogen dioxide NO_2 in the NO_x absorbent when activated,

said exhaust purification device for an internal combustion engine making the nitrogen dioxide NO_2 contained in the exhaust gas be cold stored in the NO_x absorbent in the state where said NO_x storing catalyst is not activated and executing a NO_x storing catalyst restoring control including at least raising the temperature of said NO_x storing catalyst to a predetermined temperature to activate it when a predetermined NO_x storing catalyst restoring condition is met so as to restore the cold storing capability of said NO_x absorbent in the state where said NO_x storing catalyst is not activated.

2. An exhaust purification device as set forth in claim 1, wherein said NO_x storing catalyst restoring condition is set to be met before the cold storing capability of said NO_x absorbent in the state where said NO_x storing catalyst is not activated is saturated.

3. An exhaust purification device as set forth in claim 1, wherein said NO_x storing catalyst restoring condition is set so that the cold stored nitrogen dioxide NO_2 will not be released from said NO_x absorbent in more than a predetermined amount when raising the temperature of and activating said NO_x storing catalyst in said NO_x storing catalyst restoring control.

4. An exhaust purification device as set forth in claim 1, wherein

said device has a NO_2 stored amount

estimating means for estimating an amount of nitrogen dioxide NO_2 cold stored in said NO_x absorbent and a NO_x storable amount estimating means for estimating an amount of nitrogen oxides NO_x able to be stored in said NO_x absorbent when said NO_x storing catalyst is at said predetermined temperature and

said NO_x storing catalyst restoring condition is deemed to be met when the NO_2 stored amount estimated by said NO_2 stored amount estimating means becomes greater than or equal to a predetermined amount set to not more than said NO_x storable amount based on the NO_x storable amount estimated by said NO_x storable amount estimating means.

5. An exhaust purification device as set forth in claim 1, wherein

said NO_x storing catalyst is a NO_x storing catalyst having the function of hot storing nitrogen oxides NO_x contained in exhaust gas in the NO_x absorbent when said NO_x storing catalyst is activated and the air-fuel ratio of the exhaust gas flowing into the NO_x storing catalyst is lean,

said device has a NO_x release speed estimating means for estimating a release speed of nitrogen oxides NO_x from said NO_x absorbent when making said NO_x storing catalyst said predetermined temperature and a NO_x storing speed estimating means for estimating a storing speed of nitrogen oxides NO_x to said NO_x absorbent when making said NO_x storing catalyst said predetermined temperature, and

said NO_x storing catalyst restoring condition is deemed to be met when the NO_x release speed estimated by said NO_x release speed estimating means becomes greater than or equal to a predetermined speed set to not more than said NO_x storing speed based on the NO_x storing speed estimated by said NO_x storing speed estimating means.

6. An exhaust purification device as set forth in

claim 1, wherein

said NO_x storing catalyst is a NO_x storing catalyst having the function of hot storing nitrogen oxides NO_x contained in exhaust gas in the NO_x absorbent when said NO_x storing catalyst is activated and the air-fuel ratio of the exhaust gas flowing into the NO_x storing catalyst is lean,

said device has a NO_x release speed estimating means for estimating a release speed of nitrogen oxides NO_x from said NO_x absorbent when making said NO_x storing catalyst said predetermined temperature, a NO_x exhaust speed estimating means for estimating an exhaust speed of nitrogen oxides NO_x from the internal combustion engine, and a NO_x storing speed estimating means for estimating a storing speed of nitrogen oxides NO_x to said NO_x absorbent when making said NO_x storing catalyst said predetermined temperature, and

said NO_x storing catalyst restoring condition is deemed to be met when a sum of the NO_x release speed estimated by said NO_x release speed estimating means and the NO_x exhaust speed estimated by said NO_x exhaust speed estimating means becomes greater than or equal to a predetermined speed set to not more than said NO_x storing speed based on the NO_x storing speed estimated by said NO_x storing speed estimating means.

7. An exhaust purification device as set forth in claim 1, wherein

said NO_x storing catalyst has the function of releasing, reducing, and purifying the nitrogen oxides NO_x which had been hot stored in the NO_x absorbent when said NO_x storing catalyst is activated and when making the air-fuel ratio of the exhaust gas flowing into the NO_x storing catalyst smaller and establishing the presence of a reducing agent in state, and

said NO_x storing catalyst restoring control includes making the air-fuel ratio of the exhaust

gas flowing into the NO_x storing catalyst smaller and establishing the presence of a reducing agent in state.

8. An exhaust purification device as set forth in claim 1, further having a NO_2 ratio increasing means for increasing a ratio of nitrogen dioxide NO_2 with respect to nitrogen monoxide NO produced at the time of combustion under a lean air-fuel ratio when said NO_x storing catalyst is not activated compared with when the NO_x storing catalyst is activated in the same engine operating state.

9. An exhaust purification method for an internal combustion engine including, arranging a NO_x storing catalyst in an engine exhaust passage, the NO_x storing catalyst being comprised of a precious metal catalyst and a NO_x absorbent and, when an air-fuel ratio of inflowing exhaust gas is lean, cold storing nitrogen dioxide NO_2 contained in the exhaust gas in the NO_x absorbent when not activated and hot storing cold stored nitrogen dioxide NO_2 in the NO_x absorbent when activated,

making the nitrogen dioxide NO_2 contained in the exhaust gas be cold stored in the NO_x absorbent in the state where said NO_x storing catalyst is not activated and raising the temperature of said NO_x storing catalyst to a predetermined temperature to activate it so as to restore the cold storing capability of said NO_x absorbent in the state where said NO_x storing catalyst is not activated before the cold storing capability of said NO_x absorbent in the state where said NO_x storing catalyst is not activated is saturated.